Paper 8: Animal health in subhumid Nigeria

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Abstract

Infectious diseases continue to be the most common cattle health hazard in the subhumid zone of Nigeria. The principal ones are rinderpest, foot-and-mouth disease, and contagious bovine pleuropneumonia. Although there have been outbreaks of these in locations adjacent to the ILCA study areas, ILCA herds were not affected. A small number of cases of dermatophilosis, lumpy skin disease, papillomatosis and keratoconjunctivitis were also observed. No cases of anaplasmosis, babesiosis or heartwater were observed in indigenous cattle.

A study of helminthiasis in traditionally managed Bunaji calves was followed by research on the effect of treatment on weight gains of calves. Helminthiasis was prevalent in over 50% of calves from April to December.

Fenbendazole produced a 96% reduction in epg in seven experiments, but no significant difference in weight gains was observed between treated and control groups.

The seasonal pattern of tick load on Bunaji cattle under traditional management was investigated in order to assess the possibility of strategic use of acaricide. Twice to thrice weekly, ticks were removed by hand from 16 animals, and the species and genera determined. Tick load was low in the dry season, increased after the onset of the first scattered rains, reached a peak 1 month after the beginning of heavy rains, and declined thereafter. The dominant tick species was Amblyomma variegatum; others found were Boophilus decoloratus, Rhipicephalus (simus) senegalensis, R. tricuspis and Hyalomma spp.

Introduction

The first joint ILCA/NAPRI symposium of 1979 highlighted rinderpest, contagious bovine pleuropneumonia, trypanosomiasis and dermatophilosis as the major health constraints to livestock development in the subhumid zone of Africa. The main objective of the ILCA Subhumid Zone Programme is to improve livestock output through improved forage production and utilization. Inevitably, the herds that adopt the interventions will increasingly stay and graze in the same area. This trend could introduce new health problems that the traditional systems tend to avoid. The build-up of internal parasites is one such potential problem. The control measures applicable to Fulani herds, particularly for gastrointestinal parasitic infestation in young cattle, were therefore investigated.

The veterinary research work so far carried out by the ILCA team has been mainly concerned with the monitoring and surveillance of animal health problems in traditionally managed cattle. In-depth studies were conducted on:

1. Helminthiasis in traditionally managed Bunaji calves, including the effect of treatment on weight gains.

2. The seasonal pattern of tick burden on cattle.

The health of F_1 Bunaji x Friesian crossbred cattle, introduced into pastoralists' herds in the case study areas, was also monitored.

Materials and methods

Cooperating pastoralists were visited at least once every fortnight. During these visits all animals reported sick were examined to establish disease incidence, and necessary samples were taken for laboratory analysis. If deaths occurred between visits, the owner was questioned in order to establish their cause. Adult

animals were seldom available for postmortem because they were sold and slaughtered in extremis.

Internal parasites

In 1982, a study was conducted to investigate the effect on weight gains of treatment against naturally acquired helminthiasis in traditionally managed Bunaji calves. A total of 92 Bunaji calves, unweaned and under 6 months, were included in the survey.

The drug used was fenbendazole (methyl (5-phenythio) benzinidazole-2-carbonate), which is reported to have a broad anthelmintic spectrum against gastro-intestinal nematodes (Fabiyi et al, 1980).

Faecal samples were collected monthly and analysed. Fenbendazole in ready-to-use aqueous suspension was administered orally at a dosage of 5 mg per kg of body weight. Control groups were treated with weak milk solution. A week after each treatment a past-treatment faecal sample was taken to check the efficacy of the drug. The calves were divided into three groups:

Group A:

Treatment regime: five times - end of dry season (April), beginning of rains (June), middle rains (August), end of rains (October), and early dry season (January).

Group B:

Treatment regime: three times - June, August, October.

Group C:

Treatment regime: nil.

All calves were weighed and recorded weekly. The experiment took 349 days.

External parasites

The seasonal pattern of tick burden on Bunaji cattle was also examined. Sixteen Bunaji cows were used in the study. The ticks removed by hand by the Fulani herdsmen from each cow's entire body were stored in bottles. Hand deticking of all cattle was done twice weekly during the dry season (November to March) and thrice weekly during the wet season (April to October) in accordance with the normal management routine of Fulani pastoralists. Each week, the species or genera in each sampling bottle were determined and counted.

Disease incidence

Rinderpest

Felton and Ellis (1978) have deduced, from somewhat nebulous historical evidence, that the cattle population in 1886 was about 9.1 million, which is approximately what it was estimated to be in 1981 (Federal Ministry of Agriculture, 1981). The first devastating epidemic of rinderpest occurred in 1886, and resulted in an estimated mortality of between 80 and 90%. Subsequently cattle numbers recovered to some extent before a further epidemic, following a widespread drought in 1913/14, and another in 1919/20, which caused mortalities estimated at 60%. Even in the 1920s and 1930s, when veterinary control campaigns against a range of diseases had been introduced and rinderpest was having less severe effects, the sales of cattle were such that the overall population scarcely increased (Ford, 1971).

Rinderpest can cause very high mortality (up to 90%) in newly infected areas. The introduction of tissue culture rinderpest vaccine (TCRV) in the early 1960s made its control and eradication technically feasible. A Joint Regional Campaign (JP 15) to eradicate the disease was initiated in 1962. This campaign achieved considerable success, such that by 1972 the disease was thought to have been eradicated in Nigeria. Since then vaccination has been restricted to the annual calf crop.

However, between 1976 and 1979 rinderpest was reported in Mali, Mauritania and Senegal, whence it spread to other neighbouring West African countries. In Nigeria, seven outbreaks were reported in 1980 and five in 1981. The first suspected outbreak in the Kachia LGA was in February 1980. No outbreak to date has been reported in any of the ILCA cooperating pastoralists' herds.

Contagious bovine pleuropneumonia

Contagious bovine pleuropneumonia (CBPP) has continued to be major disease problem in spite of the availability of an effective vaccine. If properly used the vaccine, based an strain T_1 44, appears to confer immunity lasting more than 12 months (Lindley, 1973). No outbreak of contagious bovine pleuropneumonia occurred in any of the ILCA cooperating pastoralists' herds. Three outbreaks were reported in 1980 and one in 1982 in the Kachia LGA.

Foot-and-mouth disease

A suspected outbreak of foot-and-mouth disease occurred in four herds in Kurmin Biri in October 1981, involving a fatal population of 242 animals. The disease took a mild course: no deaths or abortions occurred. The main clinical signs were fever, lameness due to interdigital lesions, and a sharp fall in milk offtake. The source of infection was traced to a new bull that had been introduced into one of the neighbouring herds.

Dermatophilosis (streptothricosis)

The dermatophilosis infection rate in Nigeria was reported to be 5.81% in the wet season and 3.12% in the dry season (Oduye and Lloyd, 1971). Bida (1973) recorded 11.6% and 4.1% for the wet and dry seasons respectively. Oppong (1973) observed rates of 12.8% and 4.8% in the wet and dry seasons respectively on the Accra Plains. ILCA's observations in two case study areas (Table 1) revealed rates far below the above figures.

Table 1. Dermatophilosis infection rates in cattle in the subhumid zone of Nigeria.

Location	1981		1982		1983	
	Dry season	Wet season	Dry season	Wet season	Dry season	Wet season
Abet	0.35%	2.91%	-	1.18%	1.26%	2.77%
No. of cattle examined	285	172	-	255	237	252
K'Biri	1.99%	2.24%	0.95%	1.26%	-	0.88%
No. of cattle examined	302	312	315	317	-	340
Experimental herd (Kurmin Biri)	-	25%	5.26%	23.5%	4.6%	19%
No. of cattle examined	-	-	38	34	65	62

The high infection rates in the experimental herd probably occurred for two reasons. The herdsmen hired by ILCA were not as dedicated, particularly at deticking, as other pastoralists. Secondly, the herd was made up of culled animals purchased from different cattle markets.

Other skin diseases

Lumpy skin disease (LSD) was first identified in Nigeria in 1974 (Woods, 1974). Synge (1981) reported the disease on the Jos Plateau. Other cases of suspected LSD have also occurred in various places.

In herds studied by ILCA, three suspected cases of LSD were observed in 1981 in two herds. Six cases of suspected LSD were also observed in October 1983 in one herd. The clinical signs observed were high temperature (40.5°C to 41°C), lacrimation, watery nasal and oral discharge, followed by the appearance of subcutaneous nodules of different sizes.

Cases of sucking lice (Haemotopius spp.), mostly in young unthrifty calves, were observed. There were also cases of dermatitis in young, emaciated calves, particularly in the dry season.

Reproductive disorders

Bovine brucellosis appears to be the only reproductive disease in the subhumid zone of Nigeria that has been well documented (Nuru, 1975; Esuruoso, 1974). Different prevalence rates of bovine brucellosis have been reported for Kaduna State. Esuruoso (1974) reported 17.6%, while Nuru and Dennis (1975) reported a far lower rate of 0.7%. During the period of observation, 17 cases of abortions were reported in the ILCA cooperating pastoralists' herds. Six of these were in one herd. Milk ring test for brucellosis from this herd was positive. Two cows in this herd that have a history of abortions also have hygromas.

Bovine infectious keratoconjunctivitis (pinkeye)

Pinkeye occurred in four herds in 1982 and in five herds in 1983. About 25% of both adult and young animals in these herds were infected. Cases of pinkeye appeared mainly during the months of August and September. The clinical signs were watery lacrimation, photophobia and, later, a small opacity which varied from white to yellow. Only three cases had residual opacity; all others healed completely.

Thelaziasis

Two cases of thelaziasis were observed in 1983 in one herd. These worms were observed in the conjunctival sacs of two cows; however, no conjunctivitis was observed. In both cases, the worms were physically removed by herdsmen.

Fractures and ether injuries

Fractures in young growing animals (five cases) were observed. All cases of fractures were aligned and immobilized by pastoralists, generally with success. Traumatic horn-inflicted injuries are common in most herds.

Results and discussion

Helminthiasis

Helminthiasis was prevalent in ever 50% of calves in the control group from April to December (Figure 1). Similar seasonal patterns were observed in the two treatment groups, but prevalence rates were lower than for controls. Two eggs per gram of faeces (epg) peaks were also observed in the month of June and a minor one in September in the control group (Figure 2). The abnormally high egg observed in group A in April was caused by 4 calves (cut of 35) shedding mainly S. papillosus ova. For most of the year (8 months out of 12), mean epg was below 400, even for the control group. The mean weight gains of Bunaji calves subjected to varying anthelmintic treatments are shown in Table 2.

Table 2. Mean weight gains in Bunaji calves subjected to varying anthelmintic treatments[a/].

		Mean total weight gain (kg)	Mean daily weight gain (kg)
Group A	35	63.31	0.181
Group B	33	64.81	0.182
Group C	22	59.4	0.169

[a/] Group A: treated five times; group B: treated three times; group C: no treatment (control).

Figure 1. Prevalence of helminth ova.

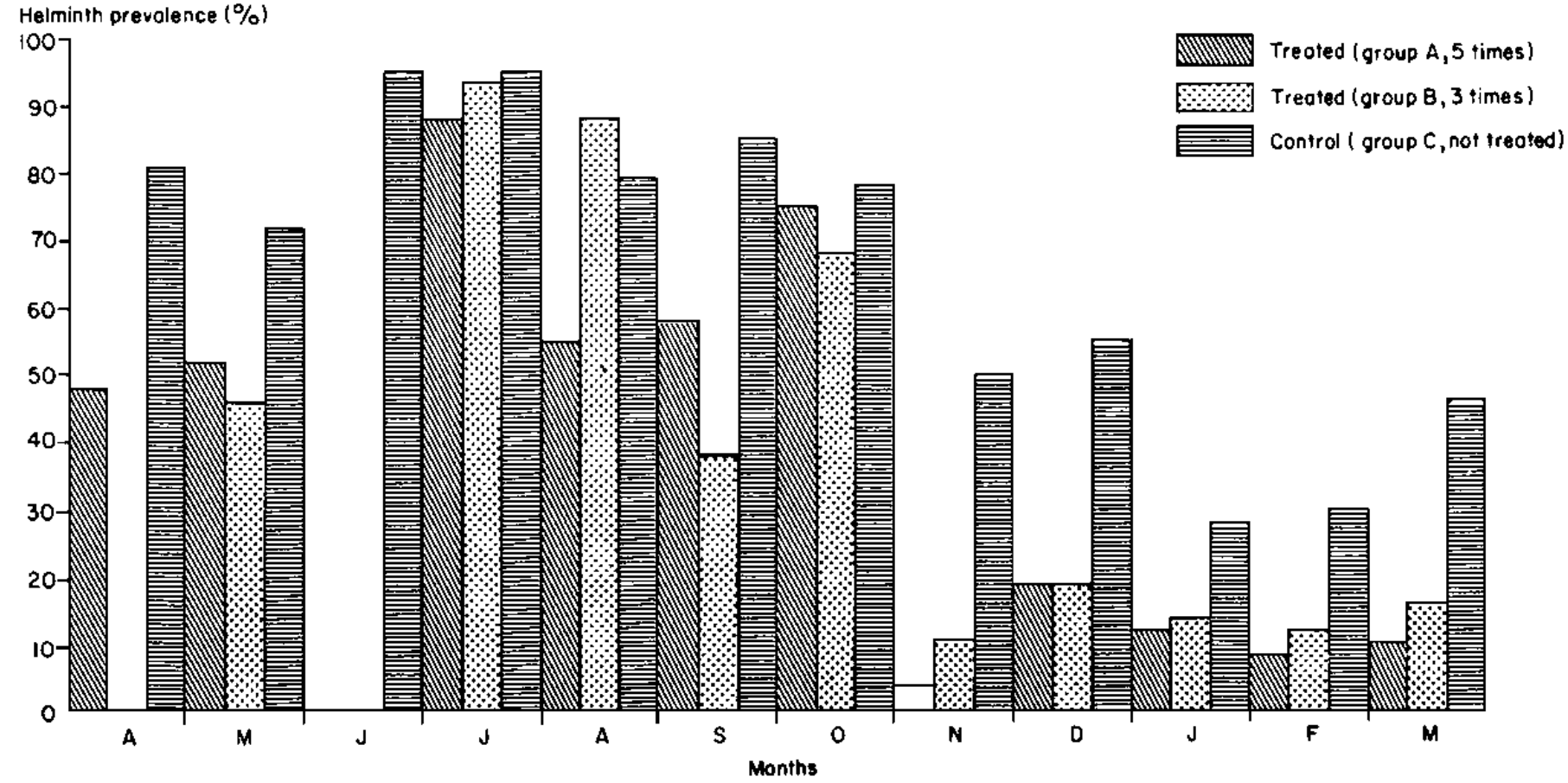
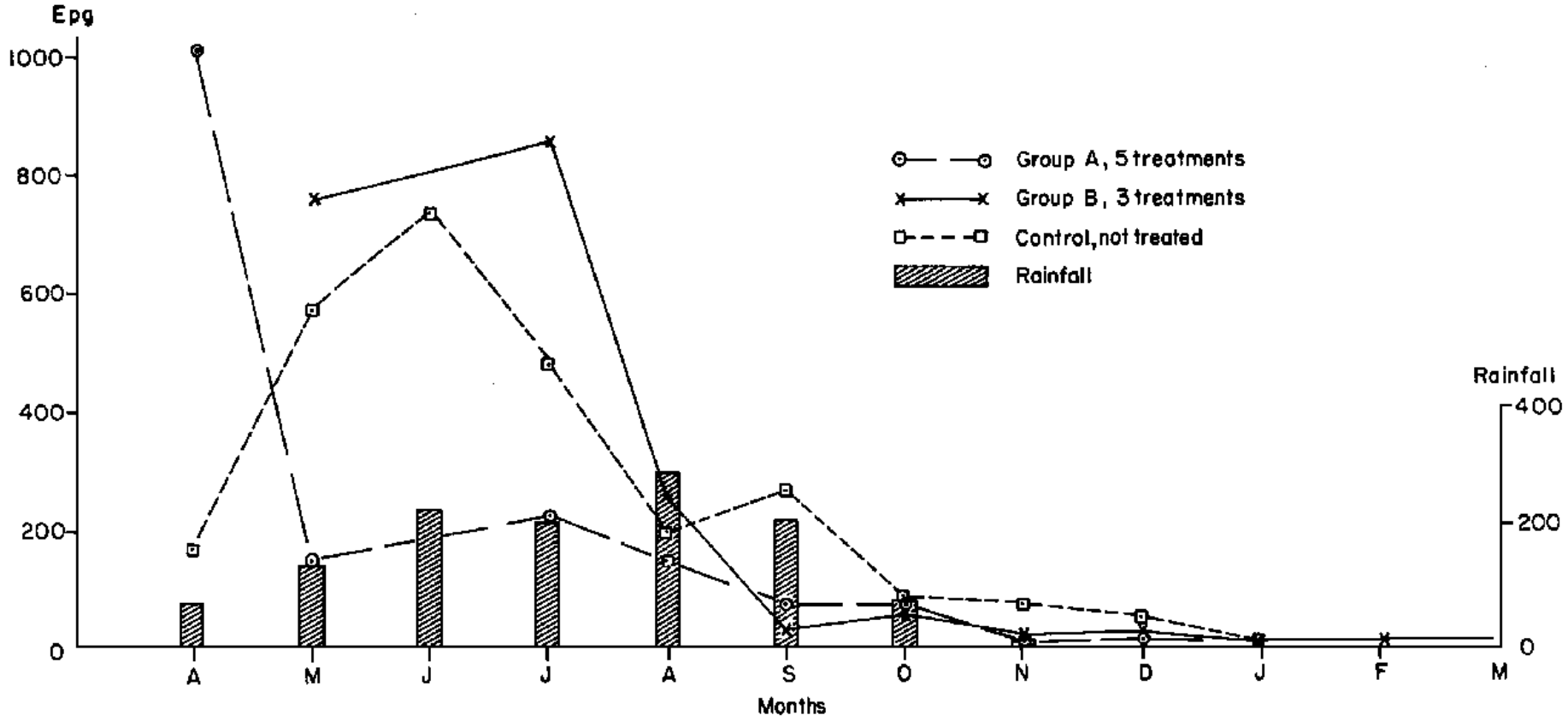


Figure 2. Epg of faeces from Bunaji calves.



The control group (C) had gained 59.4 kg by the end of experiment as against 63.31 kg for group A (t = 0.88) and 64.81 kg for group B (t = 1.33). The differences were, however, not statistically significant. Similar observations were made by Pullan and Sewell (1980) on the Jos Plateau. Waldhelm and Richard (1977) observed no significant weight gain differences between groups of feedlot cattle treated with different anthelmintics and a control group. They observed that the mode of action of antimicrobial and antiparasitic drugs was not to stimulate host growth but rather to prevent its depression.

Ross and Armour (1960) considered an epg of 600 for haemonchus as pathogenic. ILCA's observation was that in untreated calves the mean epg was below 400.

Fenbendazole was found to be effective in reducing epg in calves. It produced an average of 96.6% reduction in epg in seven experiments. The percentage reduction ranged from 78.9 to 100%. However, percentage reduction in epg of 57.6 to 66.2% was also observed in three out of four observations in control groups (Table 3).

Table 3. Percentage reduction[a/] in epg counts for Bunaji calves subjected to varying anthelmintic treatments.[b/]

Month	Group A	Group B	Group C
April	99.86	-	66.23
May	78.94	98.89	57.60
August	100	98.54	11.42
October	100	100	60

[a/] Calculated as:

$$\frac{\text{Total egg count before treatment - egg count after treatment}}{\text{Total egg count before treatment}} \times 100$$

Total egg count before treatment - egg count after treatment x 100

Total egg count before treatment

[b/] For treatments, see footnote to Table 2.

The efficacy of fenbendazole in these results is in close agreement with the findings of other workers. Fabiyi et al (1980) reported that fenbendazole achieved 100% efficacy in naturally acquired infection of gastro-intestinal nematodes in zebu cattle in Vom, Nigeria.

Rainfall is necessary for the development and distribution of trichostrongyles larvae in herbage. Lee et al (1960) observed at Shika (NAPRI) that a significant burden of trichostrongyles larvae was only acquired when rainfall exceeded 150 mm per month and the monthly mean maximum temperatures were up to about 32°C. In the ILCA case study areas, this occurs from May to September. The two peaks in both prevalence rates and epg follow the two peak precipitations observed in June and August. The fall in epg between June and September in the treated groups (A and B) can thus be attributed to the treatment-regimes. By the month of January, which is early dry season, the epg crapped to its minimum in all the three groups, doubtless due to dry-season effect on larvae. Other workers (Lee et al, 1960) have observed a similar decrease in epg during the dry season in Nigeria.

In the control group, a sharp fall in epg was also observed from June to August and from September to October. Similar observations were made by Lee et al (1960) and Synge (1981). Both authors attributed such sharp decline in epg to immune expulsion (self-cure). Stewart (1953) showed that by feeding large numbers of infective larvae a sharp crap in epg can be induced. It is postulated that the increased rainfall provides moisture which enables large numbers of infective larvae to concentrate on the herbage. Once consumed by cattle, they induce 'self-cure'. However, recent investigations suggest that there may be another, non-immunological basis for the phenomenon. Allonby and Urquhart (1973) observed lambs expelling worms after rain. Similarly, von Geldorn and Veen (1976) observed drops in epg in sheep during the early rains in Nigeria. These drops were attributed to pharmacological factors in newly growing herbage.

Some herdsmen in the case study areas have been observed treating calves with selected herbs as well as purchased proprietary drugs. Some of the herbal extracts have since been shown to be effective against Nippostrongylus braziliensis in rats (Ibrahim et al, 1983; and Paper 9).

Ticks

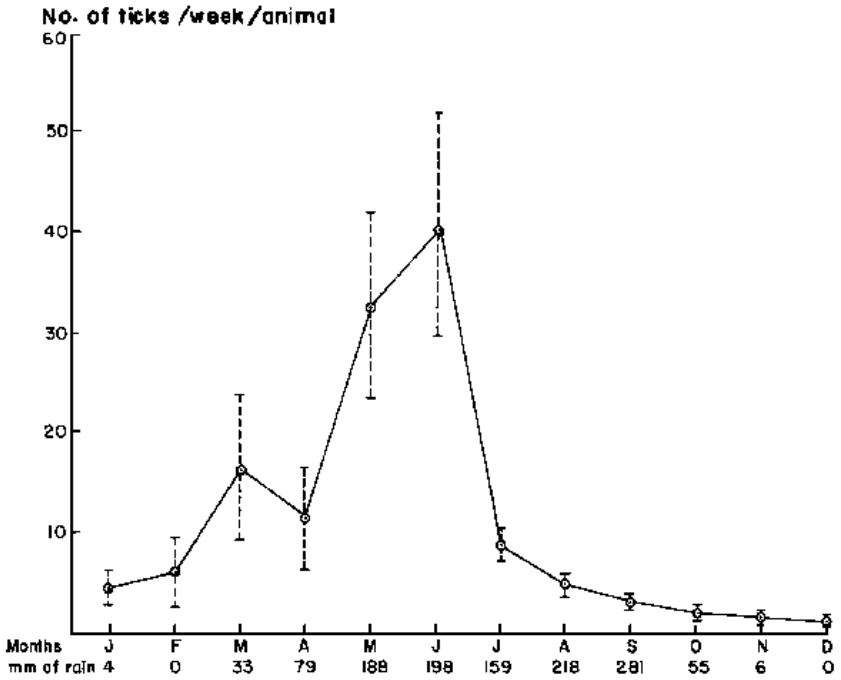
Ticks were the main ectoporasites of cattle in the zone. Pastoralists manually detick as a routine management practice three times a week during the wet season (April to October) and twice weekly during the dry season (November to March). The seasonal pattern of ticks on Bunaji cattle was investigated.

As shown in Figure 3, the tick load is low during the dry season, rises to a pronounced peak at the beginning of the wet season, and declines thereafter. The most common tick found was Amblyomma variegatum. Other ticks, in order of frequency of occurrence, were Boophilus decoloratus Rhipicephalus spp. and Hyaloma spp. (Bayer and Maina, 1984).

The overall tick load was not high, particularly if the variety of tick species is considered. Sutherst et al (1983) reported that the current threshold for economic dipping in Australia is when cattle are dropping more than 150 engorged females per day. In several Australian studies, it has been noted that European cattle breeds carry a higher tick load than zebu cattle or crossbreds (Wharton et al, 1969; Seifert, 1971; Rudder et al, 1976).

The predominant tick species found was A. variegatum, a large tick. Hand deticking involves a bias towards removal of large ticks, but still does not achieve 100% removal. This bias could be reinforced by the common Fulani practice of concentrating on the removal of the 'dangerous ticks', the kotti, in Fulfulde, which are Amblyomma. Fulani pastoralists state that the other ticks, the miri, are less harmful to cattle (Bayer and Maina, 1984).

Figure 3. Average number of ticks /week / animal on Bunaji cattle in the subhumid zone of Nigeria.



The results of the tick load study indicate that it would be feasible to use strategic chemical treatment during the early wet season to break the peak in tick load.

For cattle under traditional management, hand spraying of acaricide would appear to be a more appropriate way of application than the construction of stationary cattle dips or spray races. However, labour saving would be minimal if intensive hand spraying were to replace hand deticking as a routine. Observations on stall-fed crossbred animals in the study areas revealed that the spraying of one adult animal requires about 6 minutes and of young stock about 4 minutes per head (Bayer and Maina, 1984). The average herd size in the study area is 40 to 50 head of cattle, about 60% of which are adult. Each spraying of the entire herd would thus require 3.5 to 4 hours not including time for preparation of the spray solution and restraining the animals. Since the animals would have to be sprayed twice per week during the peak of tick occurrence, the labour requirements for tick control would average 1.5 to 2 hours per day over the critical period of about 2 months.

In contrast, the time spent by pastoralists in hand deticking is generally less than 1 hour per day in an average-sized herd, even at the beginning of the wet season (Bayer and Maina, 1984). Because no special preparation is required, hand deticking can be carried out at any time and in conjunction with other husbandry activities such as milking, and is thus more flexible than chemical treatment. However, it is clear that only ticks that are easily visible will be removed in such a short time; those high on the groin or the axillae, which are the favoured sites could easily be missed. Tick control by spraying is thus likely to be more thorough than hand deticking. Spraying may also help to minimize dermatophilosis and consequent loss of udder quarters.

A less intensive regime of minimal hand spraying of axillae, groin, udder and perineum at fortnightly intervals successfully controlled the related A. lepidum on zebu (Kenana) cattle in Sudan (Tatchell, personal communication). Untreated cattle carried 50 to 60 male and female A. lepidum but suffered no ill effects with respect to weight gain.

Besides labour requirements, other difficulties associated with the introduction of hand spraying would be the cost and availability of chemicals and equipment, water availability the repair needs of equipment, and dangers resulting from improper use of acaricide.

Although the tick burden study was visualized primarily as an aid in planning cost-effective tick control in indigenous cattle, the results are also useful in planning the introduction of exotic breeds. Whereas the significance of tick-borne diseases in indigenous cattle is ambiguous, exotic cattle have proved to be highly susceptible and may die of diseases such as heartwater, anaplasmosis and also babesiosis (Ajayi et al, 1982). Their susceptibility may be due to non-exposure to an early immunizing attack. The build-up of immunity in exotic cattle can be accelerated by means of prophylaxis. The crossbred cattle introduced into two case study areas by ILCA are treated with 2.5 mg per kg body weight of imizol (imidocard dipropionate) immediately before introduction. The treatment is repeated 2 weeks later and at 6-month intervals thereafter. The animals are subsequently sprayed to maintain a low tick challenge. This approach has been used successfully to introduce Friesian x Bunaji crossbred cows into the study area (Bayer and Maina, 1984). Before adoption of the prophylaxis approach, 25% of the introduced animals died as a result of babesiosis and anaplasmosis. Since then, only one more crossbred has died from heartwater.

The seasonal pattern of tick load found in this study suggests that exotic cattle should be introduced into enzootic areas in the dry season, when they will be

exposed to relatively low tick burdens, so that they will be able to develop sufficiently strong resistance before the tick-borne disease challenge peaks after the onset of the rains. However, this would mean that the animals would be introduced during a period of nutritional stress, and the need of supplementary feeding would increase.

Conclusions

Infectious diseases have continued to be the major health hazard in the Nigerian subhumid zone, but vaccination campaigns by federal and state government agencies appear to have effectively controlled them, at least until 1982, when rinderpest resurfaced.

Faecal egg counts are affected by numerous factors and must therefore be interpreted with caution. However, the number of eggs in faeces may still be considered as a rough index of the number of worms in the intestinal tract. ILCA's observation of an epg count of 400 may have been influenced by the use of proprietary drugs and traditional herbs used by pastoralists. However, the adoption of forage interventions by pastoralists will increasingly cause them to stay and graze in the same area. This will increase the build-up of internal parasites, so that the helminth infestation will become a major constraint. Increased productivity due to improved nutrition may also bring about metabolic diseases.

Seasonal patterns of tick burden on cattle found in this study are such that the strategic use of acaricides in the early wet season may be a cost-effective method of breaking the peak in tick challenge. However, at least in the case of indigenous cattle, strategic hand spraying is unlikely to be a suitable alternative to the present practice of hand deticking, largely because of labour and material input requirements of hand spraying relative to hand deticking.

The dry season, as the time of low tick challenge, would be the most appropriate period for introducing exotic cattle. Animals introduced into the zone should be supported by appropriate prophylactic treatment. Imizol (imidocard dipropionate) appears to confer effective immunity against anaplasmosis and babesiosis. For heartwater, tetracycline treatment would be more appropriate. Calves born to immune crossbreds appeared to be immune to tick-borne diseases. A less intensive regime of minimal hand spraying of axillae, groin, udder and perineum at weekly intervals during the months of February to August and at fortnightly intervals thereafter will minimize dermatophilosis and the consequent loss of udder quarters in crossbred cattle.

Future research

The programme's future veterinary research should focus on the following:

1. In Nigeria, rapid agricultural expansion and heavy hunting pressure have transformed the habitat and removed the wildlife hosts of tsetse. Bourn (1983) concluded that as a result there has been a fundamental shift in the vector-host-parasite relationship and that the very nature of the disease has changed. Future research should investigate the prevalence of trypanosomiasis and its effect on productivity.

2. Ogunrinade and Ogunrinade (1980) estimated a 2.5% annual incidence of fascioliasis with an annual mortality of 1% in Nigeria. On the Jos Plateau Synge (1981) fauna that 31.6% of all adult animals sampled were positive for Fasciola gigantica ova. In ILCA's experimental sheep flock fascioliasis has been the main cause of mortality. There is therefore a need to assess the economic importance of fascioliasis in cattle and sheep in Nigeria's subhumid zone.

3. A study on reproductive disorders needs to be conducted to establish the causes of the low productivity of local herds.

4. Observations on the health of crossbred cattle need to be continued with a particular focus on dermatophilosis. The effect of intensive hand spraying on dermatophilosis needs to be monitored.

5. The general health status of small ruminants needs to be investigated. Preliminary analysis of goat and sheep sera samples has shown positive reactions to the following diseases infectious bovine rhinotracheitis (46%), peste des petites ruminants (7.5%), bluetongue (78%), and contagious ecthyma (orf) (57%).

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